The Refrigeration Service Engineer

AUGUST • 1935

Multiple Hook-ups • Insurance for the Service Business • Controls—Suggested Settings • Changing Freon System • M & E Domestic Compressors

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The REFRIGERATION SERVICE ENGINEER

Devoted to the Servicing of
REFRIGERATION UNITS *and* OIL BURNERS

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Table of Contents

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The Refrigeration Service Engineer

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

VOL. 3, NO. 8 CHICAGO, AUGUST, 1935 $2.00 per Annum

A Discussion of Various Hook-ups and the Use of Uniform Symbols

The Author Points Out the Need for Some Uniform Method of Designating Various Parts Used in System.

By HERBERT HERKIMER*

READERS of *The Refrigeration Service Engineer* have had opportunities of reading some very interesting articles on two-temperature control by Mr. J. Askin of the Fedders Company. Also members of the Refrigeration Service Engineers' Society should read over carefully the lecture by Mr. George H. Clark, of the National Educational and Examining Board, on multiple systems. Readers should also refer to article by Mr. Dan Wile and Mr. J. L. Schrode on thermostatic expansion valves in former issues of *The Refrigeration Service Engineer.*

It occurred to the writer, after reading above articles, that it would be a great advantage if more information of this nature would be submitted by readers. However, a great deal of work is entailed in the writing of such an article, unless a set of symbols is available that can be understood by both the reader and the writer.

In explaining multiple systems to the students of the Herkimer Institute, the symbols as shown on the Herkimer multiple hook-up Chart No. 1 have been used to advantage, and we, therefore, contribute these symbols to the Society and to readers of *The Refrigeration Service Engineer* for criticism and suggestions as to standardizing a set of symbols along similar lines. With the use of symbols, readers of *The Refrigeration Service Engineer* could send in more problems with less trouble.

To demonstrate the advantages of these symbols, the writer offers the following in explanation of Hook-Up Chart No. 1.

Multiple Installations

A multiple system means the refrigeration of two or more evaporators from one compressor operating under the following conditions:

(A) Each evaporator operating at practically the same temperature and pressure.

(B) Each evaporator operating at different temperatures and pressures.

* Herkimer Institute.

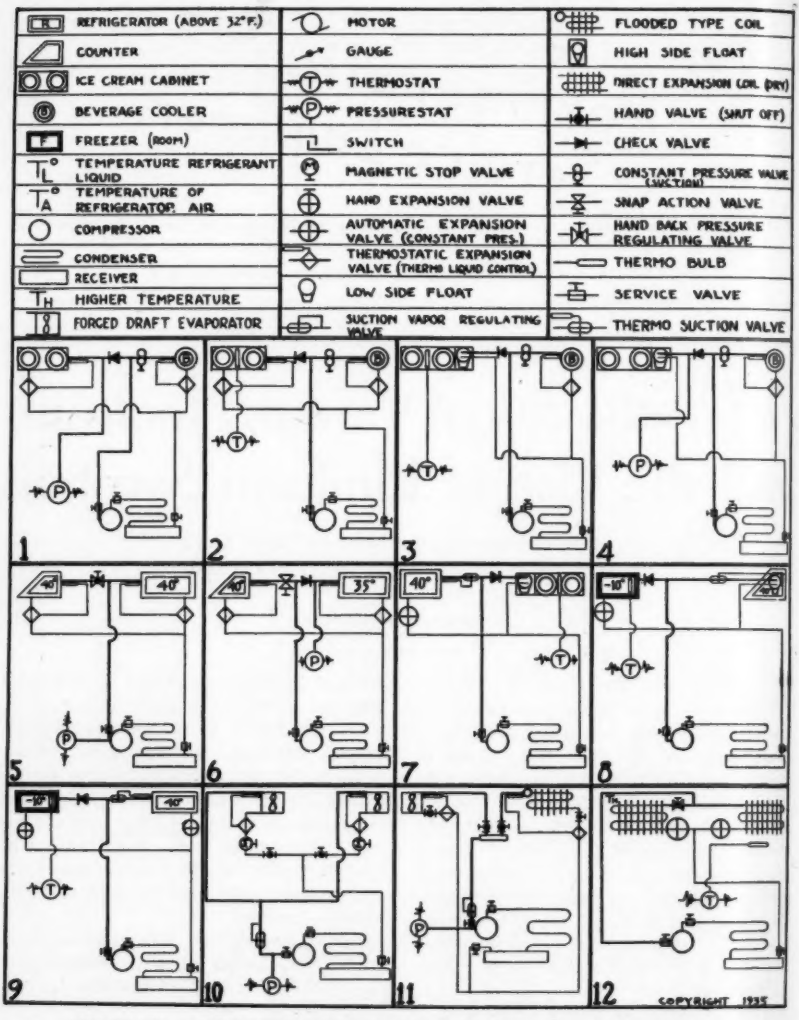

CHART NO. 1—MULTIPLE HOOK-UP CHART USING SUGGESTED SYMBOLS.

Under (A) the problems involved are quite simple and the complete system may be considered as one unit. A typical hook-up of this nature is a multiple apartment house installation, in which a dozen or more domestic refrigerators are operated by one compressor. A thermostatic expansion valve or a low pressure float valve is usually installed in each domestic refrigerator, all to be controlled by one low pressure switch connected in the basement to the compressor.

Under (B), however, it is often desired to multiplex equipment with different evaporator temperatures and different service requirements. A soda fountain service is a typical example. The ice cream cabinet, for

instance, must be maintained at a temperature of the order of —10° F., while the same compressor must operate on a drinking water cooler, which must be maintained at a temperature not lower than 35° F. in order to prevent the freezing up of the water cooler. Typical hook-ups of this nature are shown on the Herkimer Multiple Hook-Up Chart No. 1 illustrated.

Two-Temperature Valves, Refrigerant Vapor Control Valves, Suction Temperature Valves

Various methods of controlling the supply of liquid fed to the evaporator are by means of automatic expansion valves, thermostatic liquid control valves, low pressure floats, etc. However, in multiple installations it has been found necessary to control the flow of refrigerant vapor from the evaporators and control the pressure and temperature in the evaporator.

These devices are generally known as

(1) The Snap Action Valve.
(2) The Constant Suction Pressure Valve, sometimes called "The Automatic Regulating Valve."
(3) The Thermo-Suction Valve, sometimes called a "Thermostat Regulating Valve."
(4) The Suction Vapor Regulating Valve, sometimes called the "Pressure Regulating Valve."
(5) The Check Valve.
(6) Manual Suction Line Control or Back Pressure Regulating Valve.

All above devices are installed in the suction line usually past the frosted portion, and are hereinafter defined as "Two Temperature Valves."

The Snap Action Two-Temperature Valve

The snap action two temperature valve is placed in the suction line of the higher temperature evaporator, whether the liquid control consists of a thermostatic valve or a low pressure float. The snap action two-temperature valve is ideal for controlling defrosting evaporators and for maintaining definite evaporator temperatures. At least one-half of the total load should be connected directly to the condensing unit at all times when using snap action valves. The valve is very positive in action and is set to definite cutting-in and cutting-out points. It is used to control the temperature of drinking water coolers and beer coolers, operating in conjunction with the thermostatic control liquid feed or low pressure floats. When using this valve the low pressure control switch is set to handle the lowest temperature evaporator.

The Constant Suction Pressure Valve

This valve was designed originally for soda fountain application where two different temperatures were to be maintained. It may be used on other installations where different evaporator temperatures are required on multiple equipment, providing there are no evaporators on the system expected to automatically defrost. When the valve is once adjusted for a predetermined minimum pressure, it prevents the pressure from ever going below this minimum, although the pressure may rise above the setting during certain periods of the cycle. This type of valve is simply a throttling valve which opens or closes at slight suction pressure changes. Generally speaking, it should not be used with finned evaporators where automatic defrosting is required and on units not larger than ½ h.p.

The Thermo-Suction Valve

This thermostatic type of regulating valve was developed to improve the operation of multiple systems where very sensitive control is required and extremely low temperature, and is an improvement over the automatic regulating valve. It has a tight closing feature, which controls accurately ice formation on water coolers and can be used where defrosting is not essential.

The Suction Vapor Regulating Valve

The function of this valve is to regulate the back pressures in the crankcase of the compressor. This valve should be used on apartment house installations, trucks, air conditioning units, etc., where high back pressures occur during the shut-down period or during periodic defrosting, causing blowing of shaft seal and excess starting torque on motor. It is also used on double refrigerant beverage coolers. Valve may be adjusted by changing spring tension.

The Check Valve

The check valve is applied on multiple installations to keep the high pressure gas in the warmer evaporator from backing up into the colder evaporator. It is installed between the outlet of evaporator and suction side of compressor. A check valve is additional insurance of accurate pressure control as it permits only one way refrigerant flow. The check valve should be installed at the outlet of the lower temperature evaporators and the two temperature valve at the outlet of the higher temperature evaporators when connected in multiple. This same reasoning applies to two or more thermostatic expansion valves in multiple, two or more low pressure floats in multiple, or any combination of thermostatic expansion valves and low pressure floats in multiple. The check valve is omitted from the highest temperature low side, but it should be placed at the outlet of all other low sides, and of course, the two-temperature valves should be omitted from the lowest temperature low side and placed at the outlet of all of the other low sides. The low temperature evaporator is controlled by the low pressure control switch on the compressor motor.

Manual Type

The manual type back pressure regulating valve is an ordinary two-way or three-way service valve. To save expense of an automatic regulating valve, some service men throttle the suction manifold valve on a meat counter connected in multiple with a walk-in refrigerator.

Two-Temperature Valves and Their Operation

Two-temperature valves permit the operation of two or more evaporators at different temperatures from one compressor by closing the suction controlled evaporator when the temperature of it has been reduced to the desired point. The compressor continues to operate on the lower temperature evaporator until the desired temperature is reached, at which point the temperature control cuts-out. The suction controlled evaporator remains cut-off from the suction line until its temperature has raised sufficiently to again open the valve. In this respect the operation of the suction controlled evaporator is the same as though it were connected to a separate compressor. Three kinds of two temperature valves are now available from supply house stock—(A) the pressure type —(B) the thermostatic type—(C) the manual control type.

(A) *Pressure Type:* The pressure type two-temperature valve is usually of the balanced pressure type. When the valve is closed, a spring holds the valve against the seat. As the pressure of the refrigerant increases in the controlled evaporator, due to the increase in temperature, the pressure against the diaphragm or bellows increases. When the pressure has become sufficient to over-balance the spring pressure in the opposite direction, the bellows forces open the valve, thus increasing the refrigeration effect. The evaporator temperature and pressure then decrease, due to the compressor suction, until the spring pressure over-balances the pressure against the bellows and the valve closes. Three kinds of pressure type valves have been developed:

(a) The snap action type.
(b) The throttling type constant suction pressure valve.
(c) The throttling type suction vapor regulating valve.

Typical examples of the snap action type valves are:

(1) The Frigidaire Snap Action Valve, Type SAV, which was applied to Frigidaire installations beginning in the early part of 1929. The valve is set at the factory for a cutting-in of about 10 pounds and a cutting-out of about 10 inches. However, this setting may be varied.
(2) Fedders Type SA-37 Valve, made in capacity of 750 B.t.u. per hour up to 18,000 B.t.u. per hour.
(3) The Barostat Two-Temperature Valve.
(4) The Mueller Snap Action Valve.

Typical examples of the constant pressure throttling type two-temperature valves are:

(1) The Fedders CP-35 Constant Pressure Suction Valve.
(2) The Frigidaire Automatic Regulating Valve (Type ARV).

(3) The Kelvinator Model "A" Suction Temperature Valve.

A typical example of a throttling suction vapor regulating valve is:

(1) The Frigidaire Pressure Regulating Valve, Type PRV.

The PRV valves are made in several different models; viz., PRV-10, PRV-20, PRV-21 and PRV-22, and are designed for various applications, mainly with the idea of controlling the back pressure in the crank-case, as described under the subject entitled—"The Suction Vapor Regulating Valve." These valves have a throttling action, and at the same time are capable of closing off completely. They operate under variable pressure inasmuch as the power to operate the valve originates in the suction side of the compressor.

(B) *The Thermo-Suction or Thermostatic Type:* The thermo-suction or thermostatic type suction valve also operates on the balanced pressure principle. When the valve is closed, the spring helps the control rod to close off the controlled evaporator. The control bulb is located where the temperature is to be regulated and is connected to the control bellows. Sealed within the control bulb is a small amount of vapor. As the temperature of the refrigerator increases, the pressure of the sealed vapor also increases. As it becomes greater and greater than the spring pressure in the opposite direction, the valve opens more and more, allowing some vapor to flow, which permits more refrigeration to take effect, thus lowering the temperature. As the refrigerator temperature decreases, the pressure of the vapor also decreases. As the pressure within the bulb becomes less and less than the spring pressure in the opposite direction, the valve closes more and more, which cuts down the amount of refrigeration by cutting down the amount of vapor passing through the valve, which, in turn, cuts down the amount of refrigerant vaporized. The thermostatic type back pressure regulating valve is, therefore, a "throttling" type valve. Because the valve is affected mainly by the temperature of the refrigerator in which the thermostatic valve is located, its control of the cooling unit is free from the effect of variations in the refrigerating load and changes of the back pressure in other parts of the system.

Typical examples of suction type valves are Frigidaire (TRV-10), (TRV-20), and (TRV-30). The (TRV-10) is used where low temperatures are required—for ice cream cabinets and frozen food cases in multiple. The (TRV-20) is used on commercial non-defrosting coils such as used in ice cream hardening rooms, ice making coils, or other similar application. The (TRV-30) is used wherever the Frigidaire ARV is used to control temperatures in beverage or water-cooling applications. This valve can replace the ARV on soda fountain installations if desired.

The operation of the thermostatic valve is as follows: When the frost or ice diminishes, heat enters the thermostatic bulb and the pressure in the bulb compresses the bellows, causing the plunger to open, which allows gas from the evaporator to flow through the suction line to the condensing unit, thus increasing the refrigeration effect. The reverse takes place when the bulb becomes too cold. Thus the TRV offers very sensitive control, which is considered to be an advantage as compared with the constant pressure type regulating valve on the larger type beverage and water-cooling applications.

The Kelvinator Company applies the Model "D" suction temperature valve to perform the same duty.

(C) *The Manual Control Type:* The manual control back pressure regulating valve consists of an ordinary two to three-way service valve. Often the service engineer uses the manifold shut-off valve as a back pressure regulating valve.

Typical Multiple Hook-Ups (Chart No. 1)

Conditions encountered in laying out multiple systems make it very difficult to set down specific rules determining all applications. Each case should be thoroughly investigated and considered on its own merits. A few typical examples of multiple installations, shown on Herkimer Multiple Hook-Up Chart No. 1, may be used as a general guide for installations of a similar nature.

Display Case and Walk-In Meat Cooler

Fig. 5 shows a hook-up of a display case connected in multiple to a walk-in meat

cooler, the temperature in both fixtures to be about the same. However, due to service conditions, no definite temperature can be maintained in the display case. During the busy times of the day, the case temperature may go as high as 55°, while the walk-in cooler will not vary to that extent. However, the walk-in cooler represents the greatest part of the load and its temperature will be more steady than will possibly be obtained in the case. It may be found necessary to install a hand back pressure regulating valve, as shown in Fig. 5, or better, a snap action or constant pressure suction valve, as shown in Fig. 6, to obtain correct temperature conditions in the walk-in cooler. Note that in Fig. 6 the pressure switch suction line is inserted between the check valve and the meat cooler, which will give a more satisfactory cycle than the hook-up as shown in Fig. 5, which omits the check valve. If the pressure switch suction line in Fig. 6 is connected into the main line at the inlet to the compressor, too short a cycle may be obtained. The connection to the pressure switch, as shown in Fig. 6, makes the walk-in cooler the master refrigerator, which controls the operating cycle.

Multiple Ice Cream Cabinets

Fig. 1 shows a hook-up of a low temperature ice cream cabinet and a higher temperature drinking water cooler typical of a soda fountain installation. To prevent freezing up of the water cooler, a snap action or constant pressure type back pressure valve must be installed on the higher temperature drinking water cooler. Again note that the line to the pressure switch is inserted between the check valve and the lowest temperature unit, making the back pressure in the ice cream cabinet the master control. If the line to the pressure switch in Fig. 1 is connected direct into the suction line of the compressor, a very short cycle may result due to the pressure increase of the drinking water cooler coil influencing the cutting-in point of the switch. For this reason it has been found desirable for positive control to use a thermostat control as shown in Figs. 2 and 3. However, in every case the check valve is very important. Figs. 1 and 4 are the result of experiments in the Herkimer Institute of Refrigeration in order to work out a method of using a pressure switch in this type of hook-up if desired. It may be repeated here that maybe it is not desirable to use a low pressure control switch in any of the hook-ups from 1 to 4 unless the line to the pressure switch is inserted between the check valve and the ice cream cabinet.

Multiple Forced Air Evaporators

In the larger size forced draft evaporators it has been found good practice to use a magnetic liquid shut-off valve to prevent an excess flow of liquid into the evaporator in case a leaky needle develops in the thermostatic expansion valve. This device prevents flooding of the crank-case with liquid. In Figs. 10 and 11 note that in connection with the forced draft evaporators a suction vapor regulating valve (pressure type) is installed in the main suction line at compressor.

Multiple Low Pressure Control Switch Suction Connections

Referring to a previous subject entitled "Two-Temperature Valves and Their Operation," it will be seen that the warmer evaporator controls the cutting-in and the lowest temperature evaporator controls the cutting-out of the compressor, when hooked up in conjunction with a low pressure control switch. Therefore, if this condition is desirable, then the low pressure control switch suction line may be connected direct into the compressor suction in the usual manner. A check valve is very desirable, therefore, under the above conditions. However, in a soda fountain with a combination ice cream cabinet and drinking water cooler, ice cream is very much more important to maintain at the proper condition than the drinking water, so that the hook-up No. 1 is preferable. If the capacity of the higher temperature refrigerator is very much greater than the temperature of the low temperature refrigerator, and if the higher temperature refrigerator is relatively more important, hook-up No. 1 may not prove satisfactory, and it may be better then, under this condition, to hook up the low pressure control switch in the usual manner into the main suction of the compressor.

What Insurance for the Service Business

How Can the Service Organization Protect Itself from Liability Claims? A Brief Resume of Some Important Insurance Facts for the Refrigeration Service Business.

By JOSEPH JACOBSON*

AN outgrowth of early insurance has been the Insurance Broker and the Insurance Agent. You ask—is there a difference between an Insurance Broker and an Insurance Agent? Yes, there is,—and it is a vast difference! From your point of view, there is no additional expense, as insurance rates are figured so that they include a commission for these men; but, from your point of view, there is a difference in Service!

An Insurance Agent is authorized by an Insurance Company to transact business for that company, or that group of companies only, and is, in reality, an employee of that Insurance Company.

An Insurance Broker is usually authorized by the State Insurance Department to do business with any and all Insurance Companies authorized to do business in your State, is *your* employee and not an employee of an Insurance Company.

An Insurance Broker has contacts with various Insurance Companies, and if one Insurance Company, through bad experience on your type of business or in your neighborhood, declines to write your insurance, your Insurance Broker takes it to another Insurance Company. An Insurance Agent cannot go beyond the Insurance Companies he represents as an Agent!

We will now outline to you briefly certain types of insurance which we have been told you are specifically interested in.

Workmen's Compensation legislation has been developed from the early attempts to establish a practical system of laws to protect workers while in the service of their employers, and from these laws have grown our present system of Workmen's Compensation Insurance.

Workmen's Compensation Laws in the various States of the Union vary greatly in application and benefits, but are all based upon the fundamental principle that employees who are injured during the course of their employment shall be compensated without litigation. If the Labor Department discovers that you have employees, even if just an errand boy, you will be subject to a large fine if proof is not shown to them that you are insured for Workmen's Compensation and Employers' Liability (most compensation laws give the employee the privilege of electing to come under the provisions of the Compensation Act or to have recourse to the common law for the recovery of damages as a result of injuries sustained in the course of their employment;—the standard compensation policy provides Employers' Liability insurance for the employer, to protect him in the event an injured employee should waive compensation and sue for damages).

Workmen's Compensation insurance is an agreement between the Insurance Company and the Employer, stating that the Insurance Company will do as follows for the premium consideration received:

(1) To pay promptly to the employees of the named Assured, when bodily injured during the course of their employment, or to their dependents, the compensation benefits specified in the Compensation Law which applies to their individual case (after the claim has been given

* Thompson Brokerage Corp'n, New York City.

proper consideration by the Labor Board), and, to pay the proper cost of whatever medical, surgical, nurses', or hospital service, medical or surgical apparatus or appliances, and medicines, or in the event of fatal injuries, the funeral expenses which are required by the provisions of the Compensation Law;

(2) To defend, in the name of the Employer, any suits or other procedures which may result from bodily injuries to the employees occurring during the course of their employment, to pay all costs and expenses incurred on account of litigation, and to indemnify the employer against loss by reason of the liability imposed upon him by law for damages on account of injuries to employees occurring during the course of the employee's employment, up to the liability limits carried, in the event an injured employee elects to sue;

(3) To serve the employer by inspecting his work-shops covered in the policy and by suggesting improvements intended to prevent accidents—these regular inspections are made with the object of improving working conditions, eliminating hazards, and bringing your shops and/or factories up to the maximum of efficiency, thus reducing the number and severity of accidents.

The premium for Workmen's Compensation insurance is based upon your annual estimated payroll, and the rate charged is based upon each $100.00 of payroll for each particular classification (for example: $1.78 per $100.00 of payroll, or $0.16 per $100.00 of payroll—these rates are hypothetical and are merely for illustration). The term "Payroll" is construed to mean all salaries, wages, earnings for regular time, piece work, home work, tips, bonuses, allowances received by the employees because of their employment, and the cash value of all meals, lodging, merchandise, store certificates, credit, or substitutes for cash to all employees.

The actual remuneration of executive officers of a Corporation, known as President, Vice-President, Secretary and Treasurer, are included in the statement of payroll, subject to a maximum individual salary of $100.00 per week, unless they elect to be excluded under the policy. A premium charge is made upon this remuneration at the rate for the classification which describes their duties. Any executive who desires not to be included under this insurance may sign an "Officer's Exclusion Form," which states that his salary is not to be included under "Payroll," and, that if he should be injured during the course of his occupation that he does not elect to come under the provisions of Workmen's Compensation. If the Employer is an Individual (or a Co-Partnership) he does not come under the provisions of Workmen's Compensation, and his salary is not included in "Payroll."

Policy Based on Pay Roll

The policy is issued on the basis of the estimated annual payroll and the original (or deposit) premium paid accordingly. At the expiration of the policy year, the Insurance Company audits your payroll records;—if there is a larger payroll than originally estimated you pay an additional earned premium; if less, you receive a return premium from the Insurance Company (provided the deposit premium was more than the minimum premium). There is a minimum premium for which a policy is issued, and under no condition is the premium allowed to fall beneath this figure—the exact amount of the minimum premium depends upon the type of business and other supporting facts.

The New York State Legislature has passed a bill, and it has been signed by Governor Lehman, including all Occupational Diseases under Workmen's Compensation—this is a very important advancement for the cause of employees, but it also increases the cost of this type of insurance.

The need for Public Liability and Property Damage Insurance arises from the fact that any individual, co-partnership or corporation is answerable in monetary damages if through his or its negligence a member of the general public is injured or has property damaged. "Negligence," which is the basis for the recovery of damages, is usually considered by the Courts "to be the lack of the degree of care that an ordinarily prudent person would have exercised under the same circumstances." However, many different elements are involved in the average case,

which fact makes necessary a careful investigation of all the circumstances.

Damage to property can usually be appraised without difficulty, but it is often difficult to determine the amount of damages in personal injury cases. Important factors usually considered in determining the amount of damages are the degree of negligence, extent and permanency of the disability, age of the person, number of dependents (if any), etc. There is, however, no uniformity of method in arriving at the amount of damages, and because of the various factors which influence juries, judgments vary greatly even in similar cases in the same community. The trend, however, is toward higher and still higher amounts. Awards of $25,000.00 are common, and of from $50,000.00 to $75,000.00 not infrequent when one person is injured, and, of course, larger sums when several are injured.

Besides the claims in which there is merit, many fraudulent ones are instituted, usually by persons who wish to profit at the expense of those whom they involve in suit. Such cases are a source of worry and expense to defendants. A prompt and careful investigation of such cases often results in their being dropped, and the wide experience of an Insurance Company's Claim Department in handling claims for damages is valuable to you in the protection of your interest.

The specific type of this insurance that we believe affects the majority of refrigeration service men and service organizations is called "Manufacturers' and Contractors' Public Liability and Property Damage Insurance," and provides legal liability (up to the limits carried) and expense under claims for damages which arise on account of property damaged and/or bodily injuries or death accidentally suffered or alleged to have been suffered by members of the public in connection with manufacturing or contracting operations (this insures your interest any place your business may be contracted to go to perform your work).

This type of policy protects you from loss resulting from your legal liability for damages;—to completely protect your interest, the Insurance Company agrees to pay, in addition to the policy limits, surgical relief imperative at the time of the accident, the expense of litigation, and all costs taxed against you in any legal proceeding defended by the Company and all interest accruing after entry of judgment up to the date of the payment by the company of its share of the judgment.

In computing the premium for this type of coverage, the territory in which the risk is located, type of operations, the total payroll expenditure and the policy limits must be considered. All types of operations are classified, and a rate for each $100.00 of payroll under each classification is given. The policy is written for an estimated premium, subject to a final adjustment at the end of the policy year, after an audit of the payroll books has been made (however, the "Payroll" of Officers—if a Corporation, or the Partners—if a Co-Partnership, or the Individual—if an Individual, are included, with a limit of $2,000.00 annually for each of these persons).

Fire Insurance

The title "Fire Insurance" really explains itself, but the best type of coverage, to insure your stock, supplies, furniture and fixtures, etc., is to have your insurance policy read that it insures "Contents, Blanket, 90% Co-Insurance Clause Attached," which would therefore insure all of your interests at the location covered. If your policy should read a certain amount of insurance on, for example, "Stock,"—that is all you could collect, as a maximum, if fire should affect your stock. However, if your policy is written as a grand total covering "Contents, Blanket, 90% Co-Insurance Clause Attached," any amount of that total could be used for stock, or supplies, or furniture and fixtures, etc., up, of course, to a grand total of the face amount of your policy. "90% Co-Insurance Clause Attached" means that you certify that you are carrying insurance for at least 90% of the total value of your "Contents"—if you are not you become a part-insurer.

The amount of your Fire Insurance should be carefully checked at regular intervals to be sure that you are not over-insured or under-insured, but that the amount of Fire Insurance that you have is sufficient to replace, in the event of a total loss, at present day prices, less depreciation.

M & E Domestic Compressor

Construction and Service Suggestions on the M & E Vertical Reciprocating Long Stroke Compressor.

THE M & E compressor, manufactured by Merchant & Evans Company of Philadelphia, Pa., is of the open-type, reciprocating, single-cylinder, belt driven with compressor speed of 625 r.p.m. for all models except the smallest model installed in the 4.07 cubic feet job, which is operated at 725 r.p.m. This particular model is a 1 in. bore by ¾ in. stroke, while the other models installed in boxes of 5 to 7.41 cubic feet have 1½ in. bore by 1¼ in. stroke. All current models are powered by ⅙-hp. Wagner repulsion-induction motor.

The Tagliabue manual temperature control is used, while evaporators are of the McCord copper construction, and thermostatic control manufactured by the Detroit Lubricator Company and expansion valves by Mayson. The condenser is of the M & E manufacture and is a fan-cooled, fin-tube

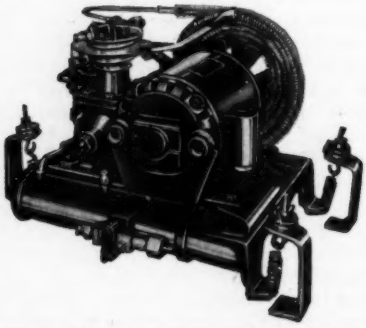

FIG. 1. M & E DOMESTIC COMPRESSOR

condenser. The 4.07 cubic feet job has an I.M.E. of 70 lbs. while the other five jobs, including the 5 to 7.41 cubic feet have an I.M.E. of 100 lbs. Sulphur dioxide is used. The company also manufactures these compressors for service replacements and new installations.

The Compressor

The compressor is of the vertical reciprocating long stroke type, fitted with condenser and flywheel or pulley with attached fan. This compressor is mounted on and bolted to the liquid receiver to which the condenser is also attached. The compressor and motor are spring supported. Fig. 1 illustrates the M & E unit. Fig. 2 illustrates the construction and refrigeration cycle.

No. 1 valve closes off passage of sulphur dioxide liquid from the storage tank under the compressor. The sulphur dioxide liquid is originally introduced through this valve into the storage tank. From this valve runs a ¼ in. diameter "liquid supply pipe" carrying liquid refrigerant to the freezing unit through purge valve No. 2 and automatic float valve into the float chamber, which is connected by two ports with the freezing unit, thus permitting the refrigerant free circulation through the freezing unit. From here, as it evaporates and becomes gaseous, it proceeds through purge valve No. 4, through the ⅜ in. diameter suction pipe and through purge valve No. 5 into the cylinder jacket and crank case.

From this latter space, the expanded refrigerant passes through port holes in the cylinder wall at the lower end of the piston stroke—being drawn into the cylinder by the vacuum formed by the down-stroke of the piston. During the up-stroke of the piston, this expanded refrigerant is compressed in the cylinder and forced through feather valve No. 6, through cylinder head and purge valve No. 7 into the condenser, where it is cooled and condensed to liquid form by the fan blast. This liquid then drains into the storage tank first mentioned in this description, where it again repeats the refrigerating cycle.

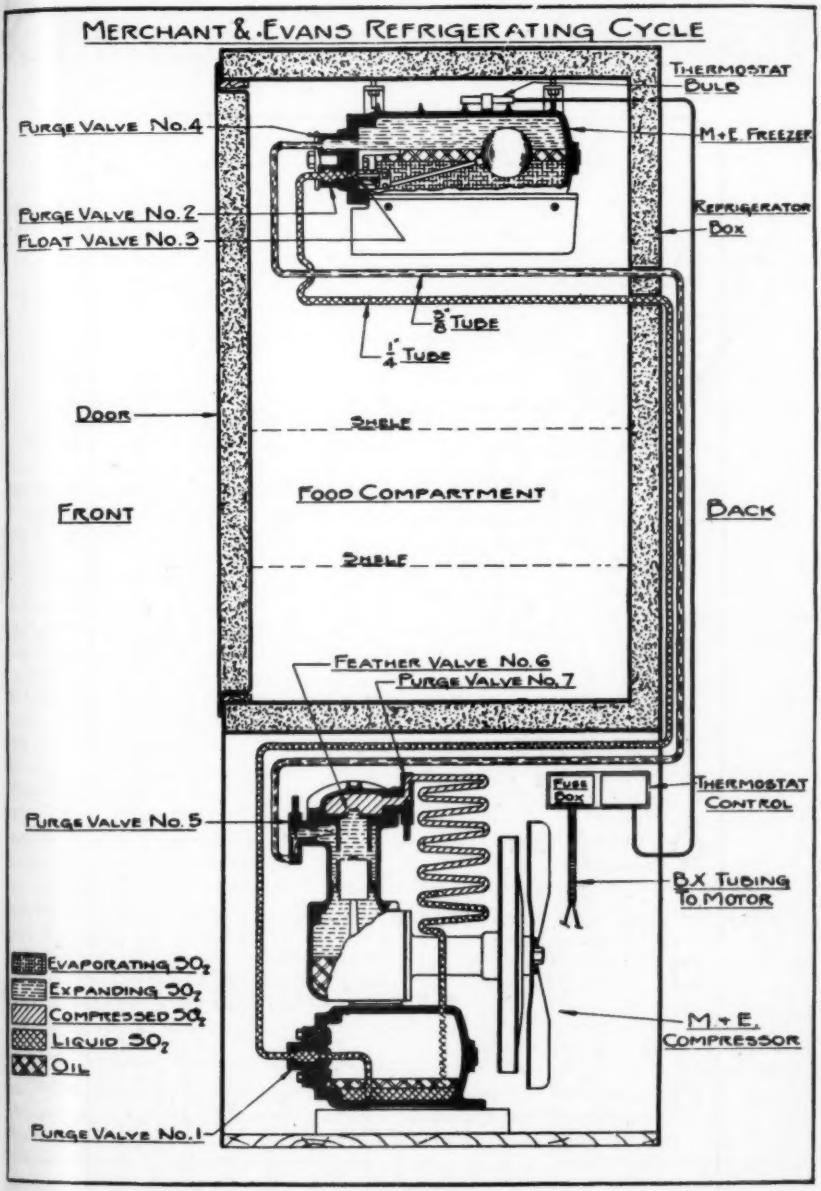

FIG. 2. CYCLE OF COMPRESSION. M & E COMPRESSOR

(Article on M & E Compressors Continued on page 24)

CHART NO. 20

Low Pressure Switch-Setting Table.
(First Trial—Cut-out—Maximum Cut-in)

1	2	3		4		5	6	7	8	9	10	11
Application	Cold Spot	Refrigerator Temp.		Refrigerant Temp. (Sat.)			Sulphur Dioxide		Methyl Chloride		Freon	
		Out	In	Out	Av. In	Max. In	Out	Max. In	Out	Max. In	Out	Max. In
Meats	Air	36	40	10°	35°	40°	2″	13	8	28	15	37
Display Case	Air	36	40	10	35	40°	2″	13	8	28	15	37
Short Order	Air	43	47	18	42	47°	2	16	13	33	20	45
Dairy	Air	38	42	14	37	42°	0″	14	10	30	18	40
Florist	Air	48	52	25	47	52°	5	21	18	39	25	50
Frozen Food Case	Air	6	10	−20	5	10°	15″	3″	6″	8	1	15
Multiple Apartment	Ice Cube	20	25	0	20	25°	9″	5	4	17	9	25
Beverage	Water Bath	36	40	14	35	40	0″	13	10	28	19	37
Salad Pan	Water Bath	36	40	14	35	40	0″	13	10	28	19	37
Drinking Water	Water Bath	45	50	25	43	48	5	19	16	31	20	45
Ice Cream Freezer	Brine	−12	−5	−18	−13	−5	—	—	5″	2	1	7
Ice Cream Cabinet	Brine	+4	+10	−10	+5	+12	14″	1″	1	9	5	15

NOTE: All pressure in pounds per square inch unless marked ″ (inches vacuum). Cold spot denotes location of thermometer.

20

Controls—Suggested Settings

A Brief Description of the Purpose of Various Controls. Their Settings.

FOR purpose of discussion, controls may be divided into two classes:

(1) Liquid Controls

(2) Temperature Controls

The object of the liquid control is to maintain an average surface temperature of the evaporator in order to obtain an average temperature of air or liquid in the refrigerator. Inasmuch as the compressor operates at a constant rate, if it would continue to run, the evaporator surface would fall below the temperature desired. Thus, it is necessary to stop the compressor when the temperature of either the evaporator or the air in the refrigerator reaches the condition desired.

If the compressor is stopped and started by the air of the refrigerator operating on a thermostatic bulb to make and break the electric circuit, the device is called the thermostatic method of controlling directly the temperature of the air in the refrigerator. However, if it is desired to control directly the evaporator surface temperature, this is done by means of a "pressurestat," or low pressure control, in a commercial system. In a domestic refrigerator it is desired to control the surface temperature of the evaporator by means of a thermostat, but thermostats are not used in commercial systems to control the evaporator temperature. Thus, the function of the commercial "pressurestat," or low pressure control, hereinafter described, controls directly the evaporator surface and indirectly the air temperature of the refrigerator.

Setting Commercial Pressure Control Switches

Good performance of automatic equipment depends upon careful adjustment of the automatic control. Many service calls can be traced to hasty setting of pressure switches or thermostatic expansion valves.

Low pressure control switches cannot be used with the constant pressure type direct expansion systems, but may be used with thermostatic expansion valve systems or with low or high pressure float systems, which take advantage of the change of pressure with load. The first setting of a pressure switch is naturally a trial setting. Chart 20 gives the service engineer an approximate idea at which points to set a "pressurestat," or low pressure control switch, to cut-in and cut-out for the first trial run.

The differential is defined in this topic as the difference between the pressures at starting, or cut-in, and the pressures at stopping, or cut-out. In the Minneapolis-Honeywell catalog the cut-out point is defined as the "cut-off" point. Some manufacturers, in their catalogs define the cut-out point as the "break" point and the cut-in point as the "make" point. Sulphur dioxide, methyl chloride and Freon systems that have been installed in the last few years under conditions of modern competition, usually operate on the following pressure differentials between cut-in and cut-out point, determined by commercial minimum of evaporator surface and compressor capacity.

PRESSURE DIFFERENTIAL TABLE
(Lbs. Square Inch)

	Fin Coils in Air	Forced Draft in Air	Liquid Bath
Sulphur Dioxide	10 to 12	8 to 10	6 to 10
Methyl Chloride	20 to 26	16 to 20	12 to 16
Freon	20 to 26	16 to 20	12 to 16

It will be noted in above table that with a forced draft evaporator the differential is decreased by about one-third. When cooling liquids, when the coils are in intimate contact with the liquid the differential is decreased about one-half under certain conditions.

If the setting for a particular installation is not specified in the contract or by the

manufacturer, the service engineer should adjust the low pressure switch for an approximate differential so that the condensing unit will start or "cut-in" at a pressure corresponding to the maximum temperature desired. Suppose it is desired to cool a walk-in refrigerator to a temperature up to about 40° F., which means that the air naturally circulated in the refrigerator is to be cooled to 38 to 40° F. In this case, the switch should be set to start or "cut-in" at a pressure corresponding to 40° at about 12 pounds for sulphur dioxide. If finned coils are used, the differential should be set for 12 pounds; e.g., to cut-in at 12 pounds for sulphur dioxide, which means cutting-out at about zero pounds. If methyl chloride is used, it would mean to set the switch to cut-in at 28 pounds and cut-out at about 8 pounds. If forced draft evaporator is installed, it would mean, with sulphur dioxide, to cut-in at 12 pounds and cut-out at 4 pounds. After operating a few days the service engineer is then in position to correct the settings to suit requirements.

The First Trial Setting of a Low Pressure Control Switch and a Thermostatic Expansion Valve

Upon completion of the installation, the first trial run is made and it is necessary to adjust the low pressure control switch approximately as determined before, because the exact setting is affected by a great number of factors, such as natural circulation, forced draft circulation, the relative size of evaporators and the capacity of the compressor. If the installation consists of a single evaporator, a different method of adjustment is possible, as follows:

(1) Adjust the thermostatic expansion valve to completely frost the evaporator.

(2) Adjust the switch to cut-out and cut-in to obtain the temperature desired.

However, this method is possible only with a single unit evaporator. With a multiple system (two or more evaporators on one condensing unit), the service man should make the first trial run by setting the switch as given in the Pressure Differential Table, or as given on Chart 20. After setting the switch the thermostatic expansion valve is then adjusted in each individual refrigerator, one at a time, until each refrigerator is cooled to the desired temperature.

If there is a great amount of product that enters the refrigerator, and there is poor natural air circulation, considerable time may elapse between the changes of temperature at various points, affecting the operation of the condensing unit. The first pressure switch setting can be adjusted then by observation of the average temperature and the operating time of the condensing unit. With methyl chloride a change in cut-out pressure of 1 pound gives about 1.7° change in air temperature in the usual range of settings. Increasing the cut-out setting 1 pound will, therefore, raise the average refrigerator air temperature from 1.5 to 2°. The differential, or point at which the machine starts up, remains constant and as above determined should not exceed the saturation temperature of the refrigerant, although it may be set to cut-in 2 to 5° lower saturation temperature than the temperature of the air in refrigerator, but never higher. The change in the average refrigerator air temperature for 1 pound change in cut-out varies from 1.3° for Freon, 1.5 to 2° for methyl chloride, and about 2.2° for sulphur dioxide. The location of thermometer to record the refrigerator air temperature is usually at the center of rear wall.

Changing the Differential

The amount of refrigeration produced during one cycle of the unit is determined by the differential. A greater differential produces more refrigeration; a lesser differential, less refrigeration. If the temperature of the refrigerator and frost conditions are satisfactory, the differential need only be adjusted in case a short cycle of operation or an excessively long cycle occurs. If the system stops and starts too often, wear and tear result, and disturbances are caused in the power circuit. A long operating period indicates that too much refrigeration is being done at a lower temperature than necessary, and possibly an excessive amount of frost will accumulate. In the absence of other reasons for adjusting otherwise, the differential can be adjusted to operate from one-half to one hour. This adjustment should not be made until the refrigerator and its contents

have been cooled to the proper temperature under average service conditions. A great amount of product and repeated opening of doors could cause an increase in running time, which should not influence the setting made. An adjustment which would give desired conditions during normal service would give very low temperatures when the conditions return to normal. It is expected that the machine should run a much longer period during hot days and heavy business.

Finned coil refrigerators for food products and all refrigerators above freezing are set to insure sufficient defrosting of the evaporator. The cut-in points for defrosting are, therefore, usually set for a pressure corresponding to 35° F. with a "pressurestat," or to suit conditions if thermostat control is used. Eliminate call-backs by careful setting of switches and valves.

Changing a Freon System to Methyl Chloride or Sulphur Dioxide

For Various Reasons It Is Sometimes Desirable to Convert a Freon System to Methyl Chloride or Sulphur Dioxide. This Article Suggests the Method of Changing.

By GEORGE H. CLARK, M.E.

OCCASIONALLY, due to a shortage of Freon and the usual difficulties in obtaining Freon, it is sometimes desired to change over a Freon system to a sulphur dioxide or methyl chloride system. If it is desired to change over a Freon system to a methyl chloride system, there are several changes required to give the same results that formerly obtained with the use of Freon.

The displacement required for methyl chloride is approximately one and one-sixth times that required for Freon to accomplish the same quantity of refrigeration. Consequently if the condensing unit of a Freon system were to be changed over to methyl chloride, to give the motor the same load and to produce the same quantity of refrigeration the compressor should be speeded up about sixteen per cent. This may be done by a slight increase in diameter of motor pulleys. In most cases one-half to three-quarters inch increase in diameter of motor pulley will accomplish this desired result.

In addition to the change in compressor speeds, it will also be necessary to adjust the pressure control and, if the machine is water cooled, to adjust the water valve to the proper operating pressures.

Column 1 of the table given shows evaporation or condensing temperatures for Freon, sulphur dioxide and methyl chloride. Columns 2, 3 and 4 show the gage pressures for each of these three refrigerants corresponding to these temperatures.

A further mechanical change that will be required is the recalibration of the float valves which may be used in the system. This may be accomplished as follows: the float ball may be changed, putting on a float of greater size or having less weight so as to provide sufficient buoyancy with methyl chloride to close the needle valve. Such a method would, however, present mechanical difficulties which make it more or less inadvisable.

Another and more practical method would be to obtain as many small springs as there are float valves in the system. These springs may be hooked from the float arm to some

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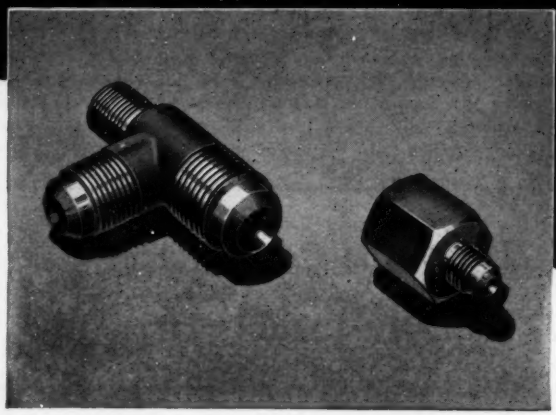

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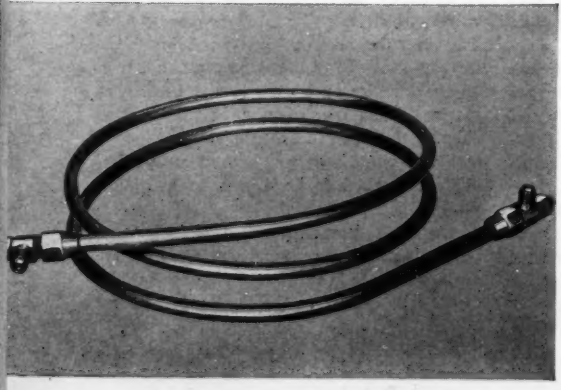

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Should there not be any back-frost, a... crease in efficiency may be obtained by ... ing the thermostatic expansion valve, a... ing more refrigerant to enter the coils. ... in effect, eliminates super-heat of the ... the evaporator—the superheat occurri... the heat inter-changer.

B. Use as a water cooled condenser ... Fig. 2). It sometimes becomes necessa... convert an air-cooled condensing unit i... water cooled unit. Purpose—to increase ... densing unit capacity. As a result of a l... gas temperature because the cooling ... temperature is usually lower than that o... air. A high pressure cut-out switch sh... be installed.

C. Use as a heat interchanger in w... coolers. (Fig. 3). The drain water flo... between the two tubes cools off the ... incoming fresh water flowing through ... inner tube, before it reaches the evapor...

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er to warn number which was anticipated when the using a he chase of the cooler was made, a heat in- he liquid l changer will often eliminate complaints of the inner rn drinking water.
rator passe 0. Use as a water cooling evaporator. inner tube ig. 4). By operating at a high suction tube. Sh sure, freezing of the water may be ed for the ded. The refrigerant flowing between the st, the cap s cools the water flowing through the d up to as ter tube. The outside of the unit should well insulated.
ck-frost, a From 10 ft. to 50 ft. for each tube, depend- tained by s upon the requirements of the job, should n valve, al used in making up heat interchangers. he coils. T en used as a heat interchanger between t of the p id refrigerant to the evaporator and the t occurrin tion vapor from the evaporator it is a gen- l rule to use one foot of heat interchanger condenser ing for approximately 250 B.T.U. per hr. es necessa perator capacity. This refers to the ¼" ing unit in d ⅝" tube combination, having ¼" and to increase " S.A.E. male flare connections.
esult of a lo How to Get Greatest Efficiency. For great- cooling w efficiency of the heat interchanger it is han that of riable to use the counter flow principle. switch sh is means that the warmer end of the first id should be in thermal contact with the nger in w rmer end of the second fluid, and the water flo lder end of the first fluid should be in off the contact with the colder end of the g through ond fluid. This results in a greater loga- the evapor mic mean temperature differential be- e using a p en the two fluids and therefore a greater creased boy t transfer.

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USED AS A HEAT INTERCHANGER BETWEEN LIQUID REFRIGERANT AND VAPOR

Fig. 1

USED AS A WATER COOLED CONDENSER

Fig. 2

USED AS HEAT INTERCHANGER IN WATER COOLERS

Fig. 3

USED AS A WATER COOLING COIL

Fig. 4

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EVAPORATION OR CONDENSING TEMPERATURES WITH CORRESPONDING GAGE PRESSURES

1	2	3	4
	Freon	Methyl Chloride	Sulphur Dioxide
0°	9.2 lbs. gage	4.0 lbs. gage	8.5″
2°	10.2	4.8	7.5″
4°	11.3	5.7	6.5″
6°	12.3	6.6	5.0″
8°	13.5	7.6	4.0″
10°	14.7	8.6	2.5″ vac.
15°	17.9	11.1	0.5 lbs. gage
20°	21.1	14.1	2.5
25°	24.8	17.2	4.7
30°	28.5	20.5	7.0
35°	32.5	24.0	9.6
40°	37.0	27.9	12.4
50°	46.7	36.8	18.8
60°	57.7	47.0	26.2
70°	70.1	58.7	35.
80°	84.1	72.	45.
90°	99.6	87.	56.
100°	117.0	104.	70.
110°	136.0	122.	85.
120°	157.	141.	106.
130°	180.	161.	122.
140°	205.	185.	144.

point higher up on the float header to act as helper springs tending to lift the floats. The helper spring should of course allow the float to open freely but should close when using methyl chloride as a refrigerant and at the same time obtain the proper refrigerant level in the evaporator. A bath which may have one side cut out to take the float valve head can be filled with water which has very nearly the same specific gravity as methyl chloride. Water at a temperature of approximately 80° has a specific gravity a very little greater than the specific gravity of methyl chloride at 20°, consequently water will make a suitable liquid in determining the shut off point of the float valve to be used with methyl chloride. A solution which has approximately the same specific gravity as sulphur dioxide can be made up of 80% carbon tetrachloride and 20% wood alcohol. The carbon tetrachloride and alcohol should be well mixed and the sulphur dioxide float may be tested out to determine at exactly what level of liquid the float valve closes; and in calibrating with water for use with methyl chloride, the float should close at the same level in the float calibration bath.

If it is desired to change the Freon system to a sulphur dioxide system, it will not be necessary to change the float valves as Freon and sulphur dioxide have very nearly equal specific gravities. However, sulphur dioxide requires approximately 55% more displacement than Freon, consequently it would be necessary to speed up the compressor 55% if the same compressor were to be used. Usually a 50% increase in speed is more than is mechanically advisable so that in order to obtain best results, it would probably be a better idea to replace the compressor with a compressor having a greater bore and stroke.

In addition to these mechanical changes mentioned, it will also be necessary to clean out each evaporator, the compressor and all refrigerant-containing parts of the system so as to insure against leaving small quantities of Freon in the system. It is not considered advisable to use the same oil with the new refrigerant which has already been saturated with the old refrigerant.

If the refrigeration system to be changed over from Freon to methyl chloride or sulphur dioxide has dry type expansion coils such as are found in commercial installations, it will only be necessary to change the oil in the machine, the compressor speed, and replace the thermostatic valves with new valves designed for use with the new refrigerant.

As an example, suppose we have a one horsepower Frigidaire Freon machine operating sixteen apartments. We find that the motor has a three inch diameter pulley. We find the pressure control is set to operate at from twelve to twenty-five pounds. We find the head pressure while the machine is running is regulated by the water valve at one hundred pounds gage pressure. It is

desired first to determine what changes are necessary in order to change this system over for the use of methyl chloride. We will suppose further that the proper charge of refrigerant for this system is approximately sixty pounds of Freon.

In order to change this job to a methyl chloride system, it will be necessary to speed the compressor up one-sixth, to obtain equal capacities. This will be accomplished by replacing the three inch diameter motor pulley with a three and one-half inch motor pulley. Then it will be necessary to remove the evaporators of the system after first removing the refrigerant. Then empty the oil out of the evaporators, the condenser, receiver and compressor.

The float valves can be checked by the calibration apparatus described previously and the floats adjusted to close the needle valve at the proper float level with the assistance of a small helper spring. When the floats are recalibrated, they may be reinstalled and a vacuum drawn on the entire system, when the system may be checked for leaks. The compressor, of course, will have a new charge of oil. The system may now be recharged with methyl chloride. Slightly over forty pounds of methyl chloride will be required to replace the sixty pounds of Freon. In addition, an extra charge of oil of approximately two quarts may be added to the compressor. This will allow one-quarter pint of oil per evaporator for the float valves in addition to the normal charge of oil in the compressor.

The low pressure control with the Freon operating at twelve to twenty-five pounds according to our table was holding the refrigerant between temperatures of approximately 6° and 25°. To obtain the same temperatures with methyl chloride, the control should be set to cut out at about six and one-half pounds gage pressure and to turn on at about seventeen and one-half pounds gage pressure. The water valve which fed water through in sufficient quantities to condense the Freon at a pressure of one hundred pounds caused the Freon to condense at a temperature of 90° according to our table. For methyl chloride to get the same condensing temperature, we will adjust our water valve to regulate the head pressure at approximately eighty-seven pounds gage. These changes are all that are necessary to convert the Freon system to a methyl chloride system.

If the same Freon system were to be converted to a sulphur dioxide system, the oil should be removed from all refrigerant-containing parts of the system as before but the float valves need not be altered. The charge of the sulphur dioxide used would be the same as the number of pounds of Freon used, or possibly a few pounds extra might be required.

The principal change that would be required in this case would be the change in compressor speed. The motor pulley should be changed from a three inch motor pulley to a four and one-half inch motor pulley. In case this change in size of the pulleys causes the compressor to operate at a speed greater than 550 or at most 600 r.p.m., it is advisable to change the compressor to one having a greater displacement per revolution. It is suggested that a 1 hp. sulphur dioxide compressor be used as a replacement and be operated at its normal speed.

With sulphur dioxide the heat transfer through the evaporator to the refrigerant is not quite as good as for most other refrigerants, possibly due to a thin oil film on the inside of the refrigerant tubes acting as an insulator; so that if the Freon was operating between temperatures of 6° and 25°, it might be advisable to have the sulphur dioxide operate at temperatures between 4° and approximately 23°. These temperatures for sulphur dioxide would require a pressure control setting of approximately seven inches vacuum to approximately three and one-half pounds gage pressure. In most instances it will be possible to obtain this setting on the control, although some controls are not designed to operate at a vacuum. In this case a change of controls would be necessary. The water valve should be adjusted to maintain a head pressure of approximately sixty pounds in order to condense the refrigerant at 90°.

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SERVICING THE M & E COMPRESSORS

(Continued from page 15)

Pipe Connections

The compression unit is connected to the freezing unit shown in Fig. 3 by two copper tubes. The "liquid line" is of ¼ in. tubing and is used to transfer liquid refrigerant from the storage tank through purge valve No. 1 to the freezer through purge valve No. 2 and float valve No. 3. The "suction line" is made of ⅜ in. tubing and is used to convey refrigerant gas from the freezer through purge valve No. 4 to the compressor through purge valve No. 5.

Fig. 4 shows a cross-section through a purge valve, five of which, with different end connections, are used with each M & E refrigerator. Turning the stem right-hand or in as far as it will go, shuts off the end connection and, therefore, all tubes attached to it, while turning the stem left-hand, or out as far as possible, will shut off passage of gas to the ⅛ in. pipe plug hole or prevent leaks of air into the system from this plug or from the stem packing.

Replacing Feather Valve Assembly

Refer to Figure 5.

1. Run compressor until pressure gauge attached to purge valve No. 5 indicates about ½ lb. pressure above atmosphere.

2. Close off purge valves No. 5 and No. 7 right-hand.

3. Take off purge valve and clamp No. 7 by taking out two 5/16 in. hexagon head cap screws.

4. Take out six 5/16 in. hexagon head cap screws from cylinder head and remove feather valve assembly.

5. Choose proper new assembly for the particular size of machine being repaired and heat sufficiently to drive off any moisture, being careful not to draw temper of feather valve. Place on cylinder while still warm, with new gaskets on both sides.

6. Attach cylinder head with six 5/16 in. hexagon head cap screws and tighten.

7. Attach purge valve No. 7 with gasket and clamp with two 5/16 in. hexagon head cap screws; leave in place loosely seated.

8. Start machine running until sulphur dioxide is detected. If it is not detected, crack purge valve stem No. 5 slightly left-hand, then immediately tighten clamp on purge valve No. 7.

9. Open purge valve stems No. 5 and No. 7 left-hand as far as possible.

10. Test for sulphur dioxide with ammonia water.

Adding Oil to Crank Case

Refer to Fig. 6.

1. Close off purge valve stem No. 4 right-hand to create partial vacuum in suction line and crank case.

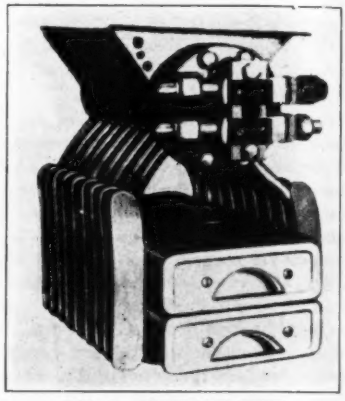

FIG. 3. FREEZING UNIT

2. Run compressor until slight vacuum is obtained.

3. Turn purge valve stem No. 5 left-hand as far as possible.

4. Take out ⅛ in. pipe plug from purge valve No. 5.

5. Attach oil can filler as illustrated (one pint size can). Use white lead on threads.

6. Fill with refrigeration oil.

7. Crack purge valve stem No. 5 right-hand. Do not suck all oil from filler; leave a small quantity to prevent air from entering. Immediately at that point, close purge valve stem left-hand as far as possible.

8. Take off oil filler.

9. Attach ⅛ in. plug tightly, using white lead on threads.

Over-Charge of Refrigerant

Care must be exercised to avoid overcharging as the capacity of the storage tank and condenser is very little more than just

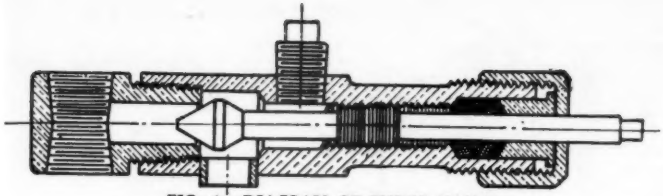

FIG. 4. DIAGRAM OF PURGE VALVE

enough to hold without excessive pressure the contents of the freezer and float tank so that these can be pumped out for repairs or accidentally in case of a stoppage in the liquid line to the freezer.

A small over-charge cannot be determined except by pumping out the freezer when it will be indicated by excessive pressure on a gauge attached to purge valve No. 1.

A large over-charge, however, will show high but not excessive pressure on this gauge without the pumping-out operation. In case such high pressure is noted, some of the refrigerant should be blown out as follows:

To Blow Out Sulphur Dioxide

1. Stop the compressor.
2. Close purge valve stem No. 1 by turning left-hand as far as possible.
3. Take out the ⅛ in. pipe plug.
4. Attach to purge valve No. 1 an empty steel refrigerant drum by means of a piece of ¼ in. copper tubing about two feet long with proper end connections to fit drum valve and the ⅛ in. pipe tapped hole in the purge valve.
5. Leaving the connection to the drum slightly loose, crack purge valve No. 1 right-hand and immediately close it, then tighten connection to bottle.
6. Open drum valve and purge valve No. 1.
7. When enough sulphur dioxide has been blown out, close drum valve and turn purge valve No. 1 as far left as possible.
8. Remove ¼ in. tube connection and replace ⅛ in. pipe plug in purge valve No. 1, using white lead on the threads.

The above instructions refer to the removal of a small quantity of refrigerant which may be necessary in case of an over-charge. Should it be necessary to remove the whole charge from the system on account of serious corrosion from moisture or for any other reason, the whole contents of the condenser and storage tank can be blown out as above described, but to remove the contents of the freezer, close purge valve No. 1 right-hand and operate the compressor, which will pump all refrigerant from the freezer and into the drum. This operation can be done more quickly if the refrigerator door is left open.

FIG. 5. FEATHER VALVE

High Pressure or Excessive Heating of Condenser Coils

Air may enter the refrigerating system during original installation, through a leak subsequently developed, or during repairs to any part, or small quantities of other inert gases may be formed by corrosion or may enter with the original or subsequent charges of refrigerant. Aside from the possibility of their forming corrosive acids by combining with the SO_2, these gases raise both the temperature and pressure in the condenser, thus overloading the motor and should be expelled immediately from the system.

The presence of inert gases can readily be detected by the pressure indicated on a gauge attached to purge valve No. 1 which normally should show a pressure 12 to 14 lbs. lower than the room temperature in degrees F.

In machines having twin cylindrical coil condensers, the presence of air will be indicated by one of the coils being much warmer than the other, but in the square flat automobile type, the only reliable indication is by pressure gauge.

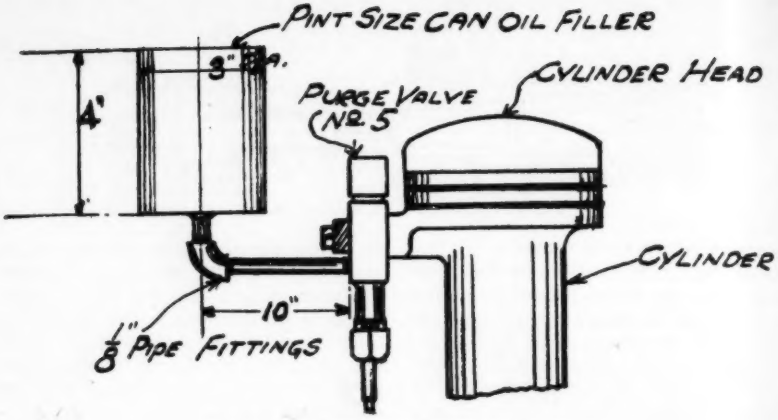

FIG. 6. FILLING CRANK CASE WITH OIL

To Purge Air from the System Proceed as Follows:

1. Stop compressor unit.
2. Close purge valve No. 7 left-hand as far as possible.
3. Take out ⅛ in. pipe plug and attach about 3 ft. of ¼ in. copper tubing.
4. Crack purge valve stem No. 7 right-hand, and allow all air and a small quantity of sulphur dioxide to escape into lye water. All air can be gotten out at one purging if it is allowed to escape very slowly. Do not try to force it.
5. Close purge valve stem No. 7 left-hand.
6. Replace ⅛ in. pipe plug.
7. Test for sulphur dioxide leaks with ammonia water.
8. After running compressor several minutes, again test condenser for air and unless normal operating temperatures and pressures are indicated, it will be necessary to perform the above purging operation again to make sure all air and other inert gases are entirely removed from the system.
9. Stop compressor for a few minutes and test all low pressure parts of system for leaks which should be stopped to prevent further leaks of air into system. When satisfied everything is O.K., start compressor again.
10. For Model 100-D and 70-D, removal of air can be accomplished by opening air valve on storage tank.

Removal of Compressor from Compressor Unit

To replace or perform any major repairs to the compressor, it must be removed from the apparatus as follows:

1. Stop compressor.
2. Close purge valves No. 5 and No. 7 right-hand.
3. Remove belt, fan and hexagon nut at end of compressor shaft; then pull off flywheel with wheel-puller.
4. Take out four cap screws, remove clamps and loosen purge valves No. 5 and No. 7.
5. Take out four cap screws in compressor base, raise suction line tubing with attached purge valve, and remove compressor from front of unit.

Installing New or Repaired Compressor

1. The new compressor should contain very nearly the same amount of oil as the one removed, which latter can have the cylinder removed to determine its oil level.

New compressors are filled with oil up to about the center line of the shaft, and if the old compressor contains much more or less than this, the new one should have its oil level adjusted accordingly. Oil can be removed from a compressor by turning it upside down and cracking purge valve No. 5 slightly left-hand after removing cap from valve connection. To add oil, proceed as

described after compressor is assembled in unit.

2. Raise suction line tube and push compressor into place.

3. Replace and tighten four cap screws in compressor base.

4. Remove new purge valves attached to compressor and replace with old purge valves attached to suction line and condenser, using new gaskets, but leave clamp on purge valve No. 7 slightly loose for purging of air.

5. Crack purge valve No. 5 slightly left-hand and close again when SO_2 gas issues from purge valve No. 7, then tighten clamp on purge valve No. 7.

6. Replace flywheel, belt and fan and tighten flywheel nut on end of compressor shaft.

7. Open purge valves No. 5 and No. 7 left-hand as far as possible and start compressor.

8. After the compressor has been running for several hours the system should be tested and possibly purged of air as described.

Changing Float Needle Valve Assembly

1. Turn purge valve stem No. 5 left as far as it will go.

2. Take out 1/8" pipe plug.

3. Attach a compound (reading pressure and vacuum) dial gauge on purge valve No. 5.

4. Close purge valve stem No. 2 right-hand to prevent sulphur dioxide (SO_2) from entering freezer.

5. Run compressor unit for two to three hours until 15" vacuum is reached and indicated on gauge by cracking purge valve No. 5 right-hand, occasionally for reading; this occasional cracking will prevent air from possibly entering through purge valve stuffing box.

6. When 15" vacuum is reached stop compressor and open purge valve stem No. 2 left-hand, slightly allowing SO_2 to enter freezer to break vacuum until gauge reads 1 lb. pressure, then close valve. This will prevent entrance of air and moisture when float tank cover is removed.

7. Close purge valve No. 4 on freezer right-hand.

8. Unscrew nut on purge valve clamp.

9. Take off purge valves No. 2 and No. 4.

10. Unscrew six 5/16" hexagon head cap screws from float needle valve assembly flange.

11. Take out float valve assembly, using one of the flange bolts as a screw jack in the tapped hole in the lower part of the cover flange.

12. Cover float chamber opening with a dry cloth to prevent air and moisture from entering.

13. Properly clean off old gasket should it stick to float chamber flange or float valve cover flange.

14. Attach new float valve assembly with new gasket. Heat all parts of new assembly before applying to drive off moisture and test the position of the ball float with the standard "M & E" test gauge.

15. Tighten six 5/16" hexagon head flange bolts.

16. Replace purge valves No. 2 and No. 4 after scraping off old gaskets, and applying new ones.

17. Attach purge valve clamp, and leave slightly loose.

18. Crack purge valve No. 2, allowing sulphur dioxide to enter freezer and when sulphur dioxide is detected leaking between gaskets of purge valves, tighten purge valve clamp tightly. This is done to drive air from inside of the freezer.

19. Crack purge valve No. 2 just enough to test all joints for sulphur dioxide leaks with ammonia water.

20. When absolutely sure of no leaks, open as far left-hand as possible purge valve stems No. 1, No. 2 and No. 4.

21. Take off compound dial gauge, but make sure purge valve No. 5 is closed as far left-hand is possible, then screw 1/8" pipe plug in place, using white lead on threads.

Sylphon Seal

The sealing faces of this device have been carefully ground and lapped to insure perfect tightness and the surrounding spaces filled with "M & E" Zero Oil at the factory, to act as lubricant. Subsequent lubrication is furnished by oil from the crank-case

which flows into main shaft bearing housing and through outer bearing into sylphon.

If for any reason the sylphon seal should squeal, leak or become badly worn, it must be removed and replaced.

Replacing Sylphon Seal RS, RM, RL

1. Stop compressor and attach compound pressure gauge to purge valve No. 5 after noting that valve stem is turned left-hand as far as possible. Crack purge valve No. 5 right-hand and note pressure. If the gauge shows any vacuum wait a few minutes until pressure rises to atmospheric (zero on gauge) or a few ounces above, then close purge valves No. 5 and No. 7 right-hand.

If gauge shows pressure much above zero, close valve No. 5 right-hand and run compressor a few revolutions until pressure drops nearly to zero, then stop compressor and close valve No. 7 right-hand.

2. Remove belt and hexagon nut at end of compressor shaft and pull off flywheel with the help of a wheel-puller.

3. Take off the large sylphon retaining nut from the bearing housing.

4. Remove sylphon from within the housing.

5. Reassemble with new sylphon gasket. Take care that all parts are perfectly clean and use new graphited gasket.

6. Screw large sylphon retaining nut.

7. Replace flywheel, belt and flywheel nut and open purge valve stems No. 5 and No. 7 as far left as possible.

8. Start compressor.

9. Should the apparatus stand idle for several hours while replacing the sylphon seal, it should be purged of air as described.

Replacing Sylphon Seal 100-D, 120-D, 70-DS and 70-DMC

1. Stop compressor and attach compound pressure gauge to purge valve No. 5. After noting that valve stem is turned left-hand as far as possible, crack purge valve No. 5 right-hand and note pressure. If the gauge shows any vacuum, wait a few minutes until pressure rises to atmospheric (zero on gauge) or a few ounces above, then close purge valve No. 5 and No. 7 right-hand. If gauge shows pressure much above zero, close valve No. 5 right-hand and run compressor a few revolutions until pressure drops nearly to zero, then stop compressor and close valve No. 7 right-hand.

2. Remove belt and hexagon nut at end of compressor shaft and pull off flywheel with help of wheel-puller.

3. Loosen hexagon nut to release spring pressure; then remove sylphon retaining nut.

4. Remove sylphon from within housing.

Purging After Repairs

Whenever any repairs have been made, even if great care has been observed to exclude air from the system, it is well to test for high pressure by attaching a compound gauge to purge valve No. 1 which will indicate by the pressure reading whether air has entered or not.

Correct high pressure for "M & E" compressor unit should be 12 to 14 pounds less than room temperature in degrees Fahr. If pressure gauge indicates higher pressure, the system should be purged.

Note—A test for air in the system as above should be made after the compressor has been running for at least 15 minutes in order to collect all air in the condenser and raise its temperature and pressure to indicate properly on the gauge.

Adding Sulphur Dioxide

The lack of the proper amount of refrigerant in the system as indicated on a gauge attached to purge valve No. 1 while chamber, and by low pressure in the condenser and storage tank as indicated on a gauge attached to purge valve No. 1 while the compressor is running.

This gauge should normally show a pressure of 12 to 14 lbs. less than the temperature of the room in degrees Fahr. Should the gauge indicate a pressure of 20 lbs. or more below the room temperature, refrigerant must be added to the system as follows:

1. Stop compressor.

2. Shut off purge valve No. 1 on the storage tank by turning stem to the left—all the way out.

3. Remove ⅛" pipe plug.

(Continued on page 36)

The REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

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REFRIGERATION SERVICE ENGINEERS' SOCIETY

SAFETY

JUST recently, we read reports of a serious accident in a refrigeration installation, which resulted in two fatalities, injuries to six others, and considerable property damage. At the present time, the real cause of the explosion is trying to be ascertained. It has been definitely determined that the cause of this accident was not due to any fault in the equipment itself or the refrigerant employed, which is non-inflammable and non-explosive.

Already steps are being taken to adopt new regulations for more rigid control of installation of refrigerating equipment. It is, of course, unfortunate that such legislation is usually adopted only after an accident of serious consequence has occurred. It is generally conceded that no person should be allowed to undertake the servicing and installation of equipment without being thoroughly qualified, and especially, having complete knowledge of the action of various gases and chemicals in contact with other liquids employed in the system. Oftentimes, such accidents are the direct result of carelessness. It should be the first rule of any service man that every job should be undertaken with the greatest precaution and that there can be no short cuts when safety is involved. It is a human frailty to get a little careless after we get accustomed to doing a certain operation repeatedly year after year without any serious results. There is a tendency to seek short cuts in order to accomplish the work in the shortest possible time. Every service man should realize that the equipment he is working with, if not handled according to the best recommended practices, is liable to lead to serious consequences and loss of life, as well as having a definite reaction upon the public who are usually not correctly informed from newspaper reports.

Regulations are adopted to protect life and property of the public and installer. They accomplish that purpose so long as they are lived up to and rigidly enforced.

S S S

ADOPTION OF UNIFORM SYMBOLS FOR REFRIGERATION

STANDARDIZATION in refrigeration practice is important to the advancement of the industry. Standardization, to a large extent, has been responsible for more economical production and more efficient operation of units in the field.

In this issue, an article appears directing attention to the absence of any uniform designation of terms commonly employed in the refrigeration service field or by the manufacturer of domestic or small commercial equipment.

In suggesting the adoption of uniform symbols, it is hoped that this article may serve as the basis for study by various associations interested in this subject.

The industry is thoroughly familiar with the various terms now employed usually designating the same piece of equipment. The adoption of symbols would simplify the presentation of papers, drawings and other material which is distributed to the servicing field.

S S S

F. Henry,
Oklahoma.

Find enclosed check for $2.00 in payment for renewal to your valuable magazine, THE REFRIGERATION SERVICE ENGINEER. I have never missed a copy yet but have lost the August, 1934, issue. Can you supply this back number? If you have dropped my name, be sure to send the June and July issues.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

Make Plans Now to Attend the 2nd Annual R. S. E. S. Convention

The Place — Detroit ◎ **The Dates — Oct. 23, 24, 25**

EVERY service man will be vitally interested in the Second Annual Convention of the Refrigeration Service Engineers' Society. The interesting program of educational papers and visits to refrigeration plants is being rapidly completed. It can be truly said that this three-day convention will represent an intensive post-graduate course in refrigeration servicing.

Detroit offers an ideal location for the Second Convention of the Society. It includes among its manufacturing plants many of the principal concerns engaged in the production of refrigeration accessories and refrigerators. Complete details of the entire program will be available shortly and in the meantime all service men, whether members of the organization or not, are invited to write to the National Secretary's office for any additional information they may desire.

The Second Annual Convention will include this year a representative exhibit of leading manufacturers of refrigeration accessories and supplies. Practically all of the space available for this purpose has been reserved and will be one of the feature exhibits of this year's convention.

CHICAGO CHAPTER

Meeting of July 9

By HARRY BUSBY, Secretary

THE meeting was called to order at 8:45 p. m.

Roll call of officers showed the following present: Messrs. Jacobsen, Roth, Skipple, Busby and Forman.

The minutes of the previous meeting were read and approved.

The meeting was immediately turned over to the educational program on which Mr. Harry Drownes gave a very enlightening talk on the Contract and Promotional Phase of the Service Business.

Mr. Goldberg gave a lengthy report on the coming stag party to be held on July 23rd in the Sky Room of the Majestic Hotel, and the remainder of the evening was spent in the discussion and arranging of this affair.

PITTSBURGH CHAPTER

Meeting of July 8th

By F. V. GOLITZ, Secretary

THE regular meeting of the Pittsburgh Chapter was held on July 8, 1935, in the Corporation Room of the Commonwealth Building. The meeting was attended by twenty-five men, Mr. C. O. McCauley presiding.

The minutes of the last regular meeting were read by the Secretary and were accepted as read.

The correspondence was read by Mr. McCauley and attention of the members was called to the Lecture Course and Mr. McCauley commented on the excellence of the material and the make-up of the Course.

The R.S.E.S. Convention at Detroit was called to the attention of the members and literature regarding same was passed around. The comments of the members left no doubt that the Pittsburgh Chapter will be well represented in Detroit.

The business meeting was closed and Mr. McCauley introduced the speaker of the evening, Mr. Capewell of the Capewell Parts Co., of Philadelphia, Pa.

The subject of Mr. Capewell's talk was "Manufacturing Refrigeration Parts." Mr. Capewell pointed out the care taken in casting, forging, heat treating and machining parts. After reviewing the history and experience of his firm in manufacturing parts for the service man, Mr. Capewell made the plea that independent servicemen patronize the independent parts manufacturer. Due to the high cost of tooling the parts, manufacturers cannot succeed without the wholehearted cooperation of the independent serviceman. It is only since the entrance of the independent parts manufacturer in the refrigeration field that the independent serv-

iceman has gained some recognition by the manufacturers of refrigeration equipment.

After Mr. McCauley thanked Mr. Capewell for the splendid talk, the meeting was adjourned.

* * *

ST. LOUIS CHAPTER

Meeting of July 11

By E. A. PLESSKOTT, Secretary

THE regular meeting of St. Louis Chapter was called to order by Vice-President Plesskott, who discussed briefly the main purpose of this meeting and then asked for nominations of officers to fill the positions of responsibility for the balance of this year. This resulted in the election of the following members:

PRESIDENT—J. D. Gray.
1st VICE-PRESIDENT—R. Pennington.
2nd VICE-PRESIDENT—C. Schneider.
SECRETARY—E. A. Plesskott.
TREASURER—L. L. Vollman.
CHAIRMAN, EDUCATIONAL COMMITTEE—R. H. Spangler.
SERGEANT-AT-ARMS—W. Alcott.
BOARD OF DIRECTORS—E. Gygax, H. L. Dahm, O. Petri.

Our newly elected president introduced Mr. H. T. McDermott, our national secretary, who spoke briefly on the need of the membership voicing their opinions in regard to the various activities of this chapter and to see that the officers carry out these wishes.

He also discussed the functioning of the eleven other chapters and gave us complete details in regard to the Second Annual Convention to be held at Detroit, October 23, 24 and 25.

Mr. R. H. Spangler of the Spangler Company has been kind enough to donate two barrels of liquid refreshments for our coming picnic; the Harry Alter Company of Chicago has sent us a generous donation, as has R. E. Thompson and Brass & Copper Sales of this city. We also have promises of assistance from several other supply firms in this locality.

Meeting of July 25

The meeting of July 25 of St. Louis Chapter, held at the Crunden Library, 14th & Cass Aves., was called to order by President Gray at 8:30 p.m.

The minutes of July 11 were read and approved as read.

Committee Appointments

Mr. Gray advised the members present that he would appoint certain ones to important committee posts, and they in turn were to select at least two men each to work with them and since Mr. Spangler and Mr. Schneider had voluntarily undertaken the soliciting for new members, they were to be jointly responsible, and have charge of the Membership Committee.

Mr. J. R. Landolt accepted the appointment as chairman of the Investigating Committee, as did Mr. B. C. Flatken for the Entertainment, and R. E. Thompson the Employment Committee. A special committee consisting of Messrs. Pennington, Petri and Gray was appointed for the purpose of getting permanent quarters lined up if possible before our winter meetings, and while it was understood that due to finances their hunt would be necessarily limited, they were to do the best they could and report progress from time to time.

The dues situation was again explained by Mr. Gray.

St. Louis Picnic

The picnic date was definitely set for Sunday, August 4th, rain or shine, and Messrs. Flatken, Gray, Landolt, Pennington, Petri, Plesskott and Vollman are responsible for the handling of all the eats and drinks so vital to its hoped-for success.

Mr. Pennington suggested Mr. Spangler contact someone for a meeting in the very near future, the subject of which is to be the proper installation and adjustment of thermostatic expansion valves.

Mr. Landolt in behalf of Mr. Schneider, has volunteered to print our meeting notices on the monthly bulletins he sends out in the field provided this information reaches him in time for inclusion.

The Secretary offered to send out cards to those not in attendance, giving them complete information about the picnic in order that they may avail themselves of this opportunity for this wonderful get-together.

CHICAGO CHAPTER CHATTER

By HERMAN GOLDBERG

NOW that the Smoker and Stag sponsored by the Chicago Chapter has been done away with, the refrigeration industry in Chicago has taken time out. The affair was everything the members and their friends hoped it would be and everything their wives feared it would be. The attendance amounted to several hundred members and their friends and a large number of new members are expected to join through this get-together.

Clark Forman's paleness lately, however, has nothing to do with a hang-over from the party, as Clark positively, as yet, has not been initiated to beer or other stimulants. It seems that Clark was called upon to evacuate a system and unfortunately inhaled too much refrigerant and although the machine is running properly, Clark is still evacuating.

Silent John Northcote had occasion to become displeased with the Ford that was his bosom companion on so many night calls and which was in the habit of talking back to John. After a final terrific tussle with the Ford, John finally gave up and got himself a Chevrolet which had doors, tires and even a top on it, and in order to keep it properly Mr. Northcote parks the Chevrolet in a garage. It is a sad story, mates. John never had driven the Ford through a door when he parked it in the great open spaces and in starting the Chevrolet the other morning, he forgot all about doors with the result that the Chevrolet now resembles Amos' open air taxi.

One of the south side boys found himself short of flare nuts and finding some old stripped fittings the size that he wanted, he sent his helper out to the hardware store to see if he could find some spare threads. The boy has not been heard from yet.

Coming back to the stag again. It certainly was remarkable to see about three hundred men duck at one time just because a silly actor squirted a little water with two hundred pounds of pressure behind it. Some fun!

I am again reminding you to make your plans to attend the convention in Detroit in October, as reports coming in from all parts of the country guarantee this refrigeration convention to be the best and largest ever held. Leading manufacturers throughout the country are subscribing for display booths and there are very few booths now available.

I have taken up enough space in this issue, but remember I am always on the lookout for more material. You can reach me at my office, 5101 West Madison Street, or phone me at Austin 6343.

MONJIAN CATALOG NO. 18 JUST OUT

THE popularity of the last Monjian catalog, and the many new items and price reductions that go to make up the new one, are responsible for the new catalog, which has just been released by the George Monjian Company, manufacturers and distributors, 360 E. Grand Avenue, Chicago, Illinois.

Monjian Catalog No. 18 is larger and contains a wider selection of items than the earlier one. This well-planned and profusely illustrated book features many nationally advertised products. Among the products featured are: a complete line of Fedders products; Imperial fittings, valves and tools; Penn and "Tag" controls; Fedders, Detroit Lubricator, Blue Ribbon, and Mayson expansion valves; Hinsdale tools; a complete listing of Rotary seals; Chieftain compressors and condensing units; Jomoco compressors; Zerozone condensing units; Gilmer belts; and Fedders condensers and evaporators. All sizes of copper tubing, flapper valves, replacement parts, and all kinds of refrigerants are also shown.

Another feature that will attract the attention of many service men is the complete listing of repair service charges. The demand for such a listing was felt by the popularity of the repair service featured in the last catalog.

The George Monjian Company operates its own modernly equipped shop where, with its up-to-date facilities and lengthy experience, it is able to handle all kinds of repair work at prices of interest to both local and out-of-town trade. The company is also prepared to make to order any special parts or appliances.

Since entering the mail order field, the George Monjian Company has established a commendable mail-order business. Mr. Monjian, president of the company, feels that his new catalog will add many new customers to the ever-increasing number.

FORSLUND'S NEW CATALOG

THE Forslund Pump and Machinery Co., of 3033 Main St., Kansas City, Mo., has recently issued their 1935 wholesale catalog containing a complete list of refrigeration equipment and accessories for the servicing field. The catalog is 8½ x 11 inches in size, completely indexed, and each price is given as list price, and as explained in the preface to the catalog this has been done so the catalog may be used as a sales manual without exposing the service man's prices.

A copy of the catalog will be mailed to any service man.

AIRO SUPPLY COMPANY SUCCEEDS UTILITIES ENGINEERING SALES COMPANY

UTILITIES ENGINEERING SALES COMPANY, 410 N. Wells Street, Chicago, Illinois, has just completed its reorganization and will henceforth be known as Airo Supply Company, according to E. P. Sorensen, president of that firm.

The new company has doubled its floor space, having acquired the adjoining property at 408 N. Wells Street. The additional floor space permits expansion in all departments, which is necessary in order to accommodate the growth of the business. A larger and more complete stock of refrigeration parts, tools, supplies and accessories is one of the added advantages the company is now able to offer its customers.

Some of the lines recently added to its extensive assortment of refrigeration and air conditioning supplies are Starr Freeze Compressors and Condensing Units, all Fedders products, piston rings, hard copper tubing in sizes from ½" O.D. to 2⅛" O.D. and a wider variety of special tools.

The company will continue to operate with its former trained and experienced staff, somewhat enlarged. Among the newer members of its personnel are J. M. Lawyer as Assistant Purchasing Agent, formerly with The Public Service Company of Northern Illinois, E. W. Scotten as Chicago District Sales Representative, formerly with the old Kelvinator Chicago Company and R. O. Berke as Texas District Representative, formerly with Apex Rotarex Company. C. E. Hamilton continues as Purchasing Agent.

BLYTHE FALL CATALOG

THE H. W. BLYTHE COMPANY, Chicago, Illinois, have just issued an enlarged Fall catalog of Refrigeration Parts and Supplies which is now ready for distribution. This catalog is very complete with a number of new items such as a full line of ammonia fittings, replacement parts for Frigidaire and Kelvinator compressors and evaporators, refrigeration lacquers, a much enlarged line of replacement seals and many other new items.

The H. W. Blythe Company have increased their business to such an extent that they have been obliged to increase their space in their present building on account of an enlarged inventory which places them in a position to serve the trade without delay.

This catalog will be sent to all service men upon request.

SERVICING M & E COMPRESSORS

(Continued from page 28)

4. Attach sulphur dioxide drum with a short length of ¼" copper tubing. Leave union nut connection to purge valve No. 1 slightly loose.

5. Purge ¼" tube of air by slightly cracking valve on drum and immediately tightening union nut connection to purge valve No. 1.

6. Open purge valve No. 1 turning stem a few turns to the right.

7. Open valve on gas drum and let liquid flow slowly from bottle into storage tank until the sizzling noise in the float valve chamber stops. The flow of liquid is readily accomplished by a slight amount of heat applied to the outside of the bottle; rags

dipped in hot water and wrapped around the bottle is the best method. Note that the liquid in the bottle must be warmer than that in the storage tank or the flow will be in the reverse direction and also that bottle should be so held that the end to which the connection is made is lowest so that liquid—not gas—will flow.

Removing (SO_2) Drum

8. Turn purge valve stem No. 1 left as far as possible.

9. Close off valve on SO_2 drum.

10. Remove ¼" tubing from purge valve No. 1.

11. Attach ⅛" pipe plug.

12. Start compressor.

Note that SO_2 drum should be weighed before and after using so as to know how much liquid was added to system.

Leaking Feather Valve

To detect leaks in feather valve, shut off purge valve No. 5 by turning stem right-hand. Start compressor and let it run until about ten inches vacuum is registered on the gauge attached to purge valve No. 5, stop compressor and watch gauge. If vacuum is not maintained several minutes replace feather valve assembly.

Note that it is desirable to start and stop compressor several times noting the action of the gauge at each stop before deciding that it is necessary to replace feather valve assembly because often the valve does not close well when the compressor is stopped on account of dirt on the seat, etc.

Leaking Float Needle Valve

Improper seating of the needle valve or sticking in the open position will cause the flow of too much liquid sulphur dioxide from storage tank to freezer where it may overflow its proper level and return through the low pressure line to the compressor as liquid instead of vapor.

The appearance of liquid refrigerant in the low pressure return line and crank-case is indicated by coldness, sweating and possible frosting of these parts. Freezing may occur in crank-case and sometimes "stick up" the compressor, blow a fuse in the electric circuit and stop the motor.

Correction—In most cases it will be found that dirt has become lodged in the needle valve, thus preventing the proper seating of the valve. In order to remedy this condition, close the high pressure line by means of purge valve No. 1 located on the storage tank, allowing the compressor to operate for about three-quarters of an hour. This will pump the refrigerant from the freezer into the storage tank where it will build up pressure. After the above-stated time has elapsed quickly open purge valve No. 1, thus allowing the refrigerant to rush into the freezer at such a rate that it will clean off and carry through any foreign substance which has become attached to the needle valve.

In case the above operation fails to correct the leakage, it will be necessary to replace the float valve assembly as described.

Closed Needle Float Valve or Purge Valve

A needle valve or its inlet through purge valve No. 2 or any other place in liquid line which for any reason has become closed will prevent new liquid sulphur dioxide from flowing into the freezer and replacing the liquid which has been evaporated and drawn away by the compressor.

As soon as such stoppage takes place, the remaining liquid will be pumped out of the freezer through the low pressure line and compressor, and be deposited in the storage tank and condensing coils. No further freezing will take place and the refrigerator and freezer will gradually assume room temperature, pressure in storage tank will be abnormally high as long as compressor remains operating and a gauge on No. 5 purge valve will indicate vacuum. Therefore, it is absolutely necessary while the apparatus is in normal operation that all purge valve stems be open as far left-hand as possible to insure free flow of liquid and gaseous refrigerant and to prevent air entering the system through purge valve stuffing boxes.

Should the stoppage occur at the needle valve, as is usually the case, it will be necessary to remove the whole float valve assembly from the float chamber for cleaning or possible replacement, and this should be done as described.

Moisture in System

The greatest care must be exercised to avoid moisture entering into any part of the refrigerating machine. The atmosphere always contains a certain percentage of moisture and if allowed to enter the system some moisture will enter with it. Pure sulphur dioxide is non-corrosive, but in combination with moisture it will form sulphurous acid which is corrosive and which will gradually eat into the metal parts and destroy them.

If moisture has entered the system in sufficient quantity to cause trouble, it will first attack the small feather valve No. 6 and needle valve No. 3 and cause the machine to stop freezing.

The presence of moisture can be most readily detected by observation of the feather valve No. 6 which comes out coated with a dense black substance and its surfaces will be found deeply pitted and scarred and the center part may be entirely eaten away.

As soon as moisture is found in the system the compressor should be immediately stopped and all the sulphur dioxide removed from the system to stop further corrosion. The compressor and freezer should be entirely disassembled, cleaned out and the extent of damage determined. All damaged parts should be replaced. The complete machine must be thoroughly baked out before new sulphur dioxide can be charged into it.

Directions for Servicing the Automatic Dry Expansion System

When using the automatic dry expansion system, it is important that the suction pressure setting be made to meet the lowest temperature cut-out position on the thermostat. Reference should be made to refrigerant tables which show the proper pressure relation to liquid temperature of refrigerant used. The actual suction pressure will be somewhat below these figures due to the efficiency of freezer design, compressor capacity, climatic conditions, etc. The expansion valve must be set to prevent freezing back on the return line at the lowest room temperature (approximately 60°), to which the refrigerator will be exposed.

At this temperature, the lowest amount of heat will have to be absorbed due to the fact that there will be less leakage through the refrigerator cabinet.

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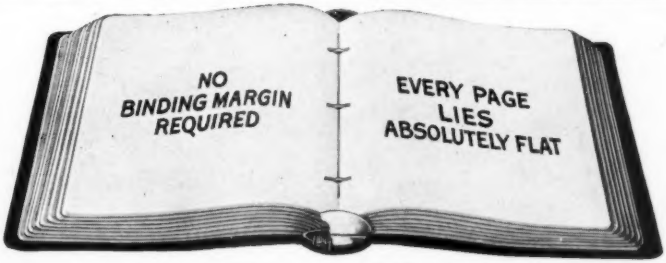

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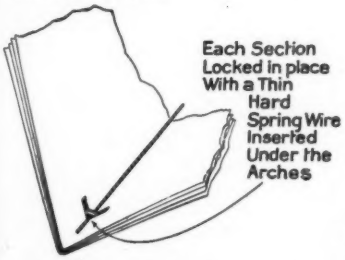

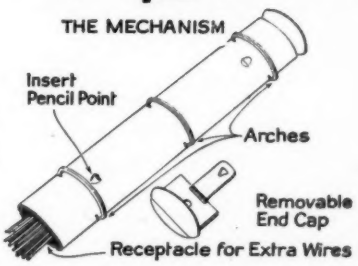

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